Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Willamette River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Albany, Oreg	99	20	10.3	8	4.0	1,2	7.0	6.3
Portland, Oreg	10	15	11.3	19	2.4	2	8.2	8.9
Edisto River.								
Edisto, S. C	75	6	3.5	1,2	2.3	16	2.8	1.2
James River.								
Lynchburg, Va. [a]	257	18	1.5	1,23	0.4	17–19	0.8	1.1
Richmond, Va	110	12	0.7	1	— 0.1	15–21	0.2	0.8
Alabama River.								
Montgomery, Ala	265	35	10.5	1	1.2	26,27	2.7	9.3
Selma, Ala	212	35	14.8	1	1.4	25–27	3.6	13.4
Coosa River.								
Rome, Ga	225	30	3.6	1	1.2	17–28	1.7	2.4
Gadsden, Ala	144	18	5.5	1	0.6	27,28	1.8	4.9
Tombigbee River.								
Columbus, Miss	285	33	13.2	1	— 0.9	16,17	1.6	14.1
Demopolis, Ala	155	35	46.0	1	4.9	28	16.7	41.1
Black Warrior River.								
Tuscaloosa, Ala	90	38	21.7	1	3.6	26,27	7.4	18.1
Pedee River.								
Cheraw, S. C	145	27	2.9	22,23	0.9	17,18	1.6	2.0
Black River.								
Kingstree, S. C	60	12	3.7	2,3,8,9	3.0	26–28	3.4	0.7
Lumber River.								
Fairbluff, N. C	10	6	2.5	4	0.9	18,19	1.7	1.6
Lynch Creek.								
Effingham, S. C	35	12	6.9	3	3.5	17,18	4.5	3.4
Potomac River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Harpers Ferry, W. Va	170	16	5.7	22	2.0	8,9	2.6	3.7
Roanoke River.								
Clarksville, Va	155	12	.....	....	......	....	.....	.....
Sacramento River.								
Redbluff, Cal	241	23	12.0	28	0.4	1–3	3.7	11.6
Sacramento, Cal	70	25	15.8	9,26,27	9.3	1	13.2	6.5
Santee River.								
St. Stephens, S. C	50	12	7.4	2–4	1.3	18–20	3.5	6.1
Congaree River.								
Columbia, S. C	37	15	1.5	1,2,21–24	1.0	26	1.3	0.5
Wateree River.								
Camden, S. C	45	24	5.6	1	3.0	27,28	3.8	2.6
Savannah River.								
Augusta, Ga	130	32	7.8	1	5.8	27	6.3	2.0
Susquehanna River.								
Wilkesbarre, Pa	178	14	11.0	13	4.0	18,28	7.8	7.0
Harrisburg, Pa	70	17	7.8	24	2.7	4–7	4.9	5.1
Juniata River.								
Huntingdon, Pa. [f]	80	24	5.2	12–14	4.0	4,26–28	4.5	1.2
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	8.4	13	2.1	4	4.4	6.3
Waccamaw River.								
Conway, S. C	40	7	2.1	24,25	1.0	18,19	1.5	1.1

† Frozen entire month. [a] Record for 16 days. [b] Record for 26 days. [c] Record for 27 days. [d] Record for 20 days. [e] Record for 24 days. [f] Record for 17 days.

SPECIAL CONTRIBUTIONS.

THE SEARCH LIGHT FOR WEATHER SIGNALS.

By Edgar B. Calvert.

The recent sinking of the battleship *Maine* in the harbor of Habana recalls to the minds of many Weather Bureau officials the first experiments made by the Government on an elaborate scale for the purpose of demonstrating the availability and value of a search light in disseminating warnings of frost, cold waves, and storms. In the early part of February, 1895, by courtesy of the Navy Department, the search light for the battleship *Maine*, then nearing completion, was loaned to the Department of Agriculture for temporary use at the Chicago office of the Weather Bureau. The Secretary of Agriculture asked the Navy Department for the loan of the instrument at the suggestion of Col. H. H. C. Dunwoody, at that time Assistant Chief of the Weather Bureau. The experiments were conducted by the present Chief of the Weather Bureau, who was then in charge of the Chicago office. The apparatus was erected on the coping of the Auditorium building at an elevation of 270 feet above street level. Its lens was 30 inches in diameter, and its electric light was estimated at about 100,000 candle power.

After some experimentation the following code was adopted:

Revolving beam of white light: Cold-wave or frost.

Revolving beam of red light: Marine storm with high easterly winds.

Revolving beam of red and white (pencil of light half and half each color): Marine storm with high westerly winds.

The white light was adopted for both cold wave and frost, because no confusion in the meaning of the signal was anticipated, as it would always mean frost in the early spring, after vegetation had started, and in the early fall, before a killing frost had occurred. It was found that the red light had a penetrating power a little less than 60 per cent of that of the white light.

The instrument was installed and the necessary electric connections made about February 15, 1895, but an opportunity for a practical demonstration of the value of the search light as a means of giving warning of impending meteorological conditions did not occur until the evening of February 28, 1895. At that time forecasts for the northwestern States were made at Chicago. The morning charts of that date indicated the possibility of a cold wave for Chicago and vicinity, preceded by high northwest gales; but the conditions were not sufficiently marked to warrant the issuing of cold-wave and storm warnings. Special observations were called for from stations in the region of the cold wave to the west. These reports were received at the Chicago office and charted about 1 o'clock in the afternoon, and from them it became apparent that the cold wave would reach that city by the following morning. After the forecast was prepared it was too late for the information to be published in the afternoon papers, as they go to press about 2 p. m. The search light had to be depended upon to give immediate warning of the coming cold.

The temperature during the afternoon of February 28 reached a maximum of 62°, and by the afternoon of the next day there was a fall of 42°, fully justifying the prediction.

The conditions were peculiarly favorable for a successful trial, the night being dark and cloudy. Shortly after the last rays of twilight had faded away the search light was adjusted, and the electric current turned on. A great beam of intensely white light pierced the blackness of the night. The machine was slowly revolved at the rate of one revolution in five minutes, and for about one and one-half hours the light was flashed over the city. To those stationed on the tower of the building the beam appeared intensely bright. It seemed to rest on the dense cloud of smoke that almost continually envelops the city. Its effect was striking and beautiful.

The press of the city had been notified in the late afternoon that a practical test would be made, and several editors had stationed observers in the various suburbs of the city at distances of 10 to 30 miles from the Weather Bureau office to watch for the light. From these observers and other persons it was ascertained that the signal was clearly seen at a distance of 20 miles. It was impossible to make an estimate of the number of persons who observed the light and understood its meaning, but as nearly 2,500,000 people reside in the district within a radius of 25 miles from the Auditorium building, the number must have been considerable, especially in view of the fact that the local press had on several occasions previous to this trial given notice of the presence of the search light in the city and explained its contemplated use. Many ignorant people were thoroughly frightened by the regular flash of the signal light around the city when told that it presaged the coming of a storm.

A more thorough trial of the efficiency of the light in disseminating marine storm signals could not be made, as navigation on Lake Michigan did not open until April 10, and the instrument had to be returned to the Navy Department shortly after that date. But few boats leave Chicago before the opening of navigation, and the owners of these can be warned of approaching storms almost invariably by telephone.

An opportunity did not occur for sending actual warnings, except under the favorable conditions of a cloudy sky; but during the course of several experimental trials it was demonstrated that the penetrating power of the light was 20 to 30 per cent less on a clear night than on a dark, cloudy night. If the moon was shining brightly the range of efficiency was still further diminished. When the sky was clear and there was no moon the natural light from the stars, augmented by the constant glow from the lights of a great city, materially reduced the distance at which the flash could be seen. A slight amount of dust or haze is of course essential, as the beam will be invisible in absolutely pure air.

No test of the efficiency of the search light in the presence of dense fog was made. This was unfortunate, but it is not thought that the flash could be seen at any considerable distance with sufficient distinctness to be understood. A red light could hardly pierce a fog to any material distance.

In the first experiments the light was revolved once a minute, but this was soon found to be entirely too fast, as the flash passed an observer 20 miles away at the rate of 125 miles per minute. A 5-minute revolution was then adopted, but even this was perhaps too fast for good results, as a person in a suburb 20 miles from the Auditorium would barely glimpse the light, or its shadow, as it went by him at a speed of about 25 miles per minute.

Several interesting suggestions were made during the course of the Chicago experiments, none of which seemed entirely practicable. The most ingenious of these was that the prediction be placed in letters about three inches in height on the lens of the search light, as for instance, "Cold wave tonight," and be thrown in glaring letters upon the clouds. This scheme, if at all feasible, would probably not prove by any means effective at a greater distance than 1 mile, but a direct trial was not made.

The present methods of distributing forecasts and warnings are effective and comparatively inexpensive. The Chicago experiments proved that search lights are not useful for this purpose except under the most favorable conditions. At present the great cost of construction, maintenance, and operation of the search lights would preclude their adoption by the Weather Bureau, even if they had been shown to be practicable under all conditions. However, it may be that at some future time the cost of the search lights will be so much reduced and their operation so simplified as to warrant their use by the Weather Bureau, in large cities and at important seaports, for the purpose of immediately disseminating general forecasts and warnings made from the evening charts.

METEOROLOGICAL OBSERVATIONS AT PORT AU PRINCE, HAYTI.

Through the kind cooperation of Prof. T. Scherer of Port au Prince, Hayti, the meteorological observations taken by him at 7 a. m., local time, or 11:49 a. m., Greenwich time, are communicated in manuscript for early publication in the MONTHLY WEATHER REVIEW. By entering these on the monthly and annual charts, published by the Weather Bureau, we obtain an important extension southeastward of our field of study. The observations are taken $1^h\ 11^m$ earlier than those of the Weather Bureau telegraph system. The original reports are in metric measures; the conversions are by the Editor.

The barometer is 119 feet above sea level; its readings have been corrected by Professor Scherer for temperature, elevation, and gravity, this latter correction is —0.064 inch; the thermometers are 6.7 feet above ground; the rain gauge, 7.2 feet above ground.

The position of Port au Prince, Hayti, is latitude 18° 34′ N., longitude 72° 21′ W., or $4^h\ 49^m$ west of Greenwich. Additional records for this station are published in the annual volume of the Central Meteorological Institute at Vienna.

Observations at Port au Prince, Hayti.

JANUARY, 1898.

Date.	Barometer reduced.	Temperature. Air.	Temperature. Dew-point.	Rel. humidity.	Wind. Direction.	Wind. Velocity.	Clouds. Kind.	Clouds. Amount.	Clouds. Direction.	Preceding 24 hours. Total rain.	Preceding 24 hours. Temperature. Max.	Preceding 24 hours. Temperature. Min.
	Inches	°	°	%						Inch.	°	°
1	30.02	72.1	67.5	86		0	k	3	se.	0.19	85.1	70.9
2	30.12	73.8	71.6	93	e.	2	k	10	n.	0.23	76.6	71.6
3	30.17	70.2	58.3	63	se.	11	k	9	ne.		78.3	69.3
4	30.10	69.4	57.7	68	se.	11	s	1			83.7	68.4
5	30.03	69.8	62.6	79	se.	4		0			83.3	66.6
6	30.05	69.8	64.6	84	ese.	2	k	0			87.6	68.5
7	30.11	70.2	66.9	90	se.	2	cs,k	1	w.	0.17	88.5	68.2
8	30.08	73.9	68.2	83	ese.	9	k	1			89.4	70.9
9	30.07	73.4	62.6	70	ese.	7	s	1			89.1	72.1
10	30.10	71.8	61.2	71	e.	9		0			86.9	69.3
11	30.08	71.8	57.9	67	e.	13		0			88.9	66.7
12	30.10	72.1	62.1	76	e.	2		0			87.3	68.2
13	30.06	72.0	62.9	74	ese.	11		0			87.4	68.4
14	30.04	70.9	61.3	74	e.	9		0			88.9	70.0
15	30.06	72.3	60.6	68	e.	11		0			89.8	70.3
16	30.04	68.5	64.8	89		0		0			89.2	68.4
17	30.02	68.2	62.1	82	ese.	2	cs	0	w.		89.6	66.9
18	30.04	75.0	56.1	54	ese.	11	cs	1	w.		89.4	70.0
19	30.07	73.6	61.7	67	ese.	13	cs	7	sw., wsw.		88.7	72.0
20	30.07	72.0	57.4	62	e.	9	cs	1			88.7	66.6
21	30.10	72.9	58.6	63	ese.	11		0			92.5	68.4
22	30.06	72.5	62.6	73	e.	7		0			90.5	70.2
23	30.11	85.3	57.4	72	se.	7		0			87.8	65.7
24	30.10	73.0	61.2	68	se.	13		0			90.5	72.3
25	30.06	72.0	61.0	70	e.	11		0			88.5	70.5
26	30.06	69.1	61.3	78	ese.	2		1			84.7	67.6
27	30.08	72.7	59.7	66	ese.	9	k	1	se.		87.1	71.4
28	30.10	73.4	60.6	66	e.	9	k	2			88.9	71.8
29	30.10	71.4	64.0	79	se.	2	k	6	ne.		85.6	69.8
30	30.10	68.2	63.0	84	se.	4	ks	1			88.7	67.5
31	30.09	67.5	60.1	79	ese.	2		0			88.2	66.4
Sum										0.59		
Means	30.08	71.2	61.9	74		7		1.5			86.7	69.8

FEBRUARY, 1898.

Date.	Barometer reduced.	Temperature. Air.	Temperature. Dew-point.	Rel. humidity.	Wind. Direction.	Wind. Velocity.	Clouds. Kind.	Clouds. Amount.	Clouds. Direction.	Preceding 24 hours. Total rain.	Preceding 24 hours. Temperature. Max.	Preceding 24 hours. Temperature. Min.
1	30.06	72.0	61.2	70	ene.	4		0			87.4	70.5
2	30.06	71.2	61.3	73	e.	2	k	1			90.0	69.8
3	30.11	69.3	63.5	83		0		0		0.06	87.4	67.5
4	30.09	67.8	64.6	90	ese.	4	s	1			86.7	66.9
5	30.06	69.4	65.8	89	ene.	2	cs	1	wnw.		86.5	68.5
6	30.02	68.5	66.7	94		0	s	1		0.04	84.6	68.4
7	30.06	70.9	64.8	81	e.	11	k	10	w.		83.8	68.0
8	30.09	71.1	59.4	68	ese.	13	k	1	n.		84.7	69.1
9	30.07	68.7	53.6	61	e.	11	ak	1	sw.		85.5	66.7
10	30.05	70.2	52.0	54	e.	13		0			88.7	67.8
11	30.09	70.0	56.7	64	e.	13		0			87.1	68.0
12	30.11	70.0	52.9	56	ese.	7		0			89.4	69.1
13	30.08	69.6	57.9	68	e.	4	k	8	nnw.		86.7	68.4
14	30.07	71.4	57.9	64	e.	11	ck, k	6	w.		87.4	69.8
15	30.06	70.7	56.8	63	e.	2	k	2	nw.		88.2	69.8
16	30.06	70.9	56.8	62	e.	2	k	4	n.		92.5	68.0
17	30.06	67.6	58.6	64		0		0			87.8	67.1
18	30.06	71.8	58.6	65	se.	2	k	1	ene.		88.5	70.2
19	30.02	68.2	63.5	81	e.	2		0			89.8	67.6
20	30.01	68.5	66.6	83		0		0		0.08	87.4	67.5
21	30.00	70.9	70.0	92		0	k	5	ne.	0.49	86.0	68.4
22	29.98	66.2	64.2	94	se.	2		0			85.3	64.8
23	30.00	68.7	62.4	82		0	k	1		0.89	88.0	66.9
24	30.04	69.8	66.2	89		0	k	7	ne.	0.20	88.0	66.0
25	30.03	66.7	63.7	85		0	ck	2		0.38	85.1	64.9
26	30.02	69.8	63.5	82	ese.	4	ck	7	wsw.		86.0	67.5
27	30.00	69.8	62.1	77	ese.	2		1		0.02	85.1	67.1
28	29.94	69.3	67.8	85	e.	4		0		0.53	85.8	67.8
Sum										2.69		
Means	30.04	69.6	61.2	76.1		4.3					87.3	68.7